Remarks

Applicant previously elected to prosecute the species of Figures 4-6. The Examiner agrees with Applicant that claims 1-28 are readable thereon. The following claims are rejected under the judicially created doctrine of obviousness-type double patenting: Item 1(a) - claim 1 over claim 12 of United States Patent No. 6, 688,267 (Raghavan '267), issued to Applicant; Item 1(b) - claims 14-17 and 19 over claims 12, 17, 18, 14 and 19 of Raghavan '267, respectively; Item 1(c) - claims 20-21 over claim 12 of Raghavan '267 in view of United States Patent No. 3,157,166 (MacNeill); Item 1(d) - claim 18 over claim 12 of Raghavan '267 in view of United States Patent No. 5,176,581 (Kumm); and Item 1(e) - claim 22 over claim 12 of Raghavan '267 in view of United States Patent No. 4,836,155 (Slagley et al.).

The following rejections are made under 35 U.S.C. § 102(b): Item 3 - claims 1-2, 4-5, 8, 12 and 27 as being anticipated by Slagley et al.; Item 4 - claims 1-2, 4-5, 12 and 27 as being anticipated by MacNeill.

The following rejections are made under 35 U.S.C. § 103(a): Item 6 - claims 9-10 as being unpatentable over Slagley et al. (as applied to claim 8 above) in view of Kumm; Item 7 - claim 11 as being unpatentable over Slagley et al. in view of Kumm, and further in view of United States Patent No. 5,642,292 (Wride); Item 8 - claim 28 as being unpatentable over Slagley et al. in view of Kumm; Item 9 - claim 3 as being unpatentable over Slagley et al. (as applied to claim 2 above) in view of United States Patent No. 6,666,178 (Keller et al.); Item 10 - claim 13 as being unpatentable over Slagley et al. (as applied to claim 12 above) in view of United States Patent No. 6,085,705 (Vorih); Item 11 - claim 3 as being unpatentable over MacNeill (as applied to claim 2 above) in view of Keller et al.; Item 12 - claim 13 as being unpatentable over MacNeill (as applied to claim 12 above) in view of Vorih; and Item 13 - claim 28 as being unpatentable over United States Patent No. 6,659,053 (Cecur) in view of Kumm.

Finally, claims 23-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The Office Action Summary indicates that claims 6 and 7 are rejected. However, no specific basis is provided in the Detailed Action for the rejection of these claims.

Items 1(a)-1(e): Obviousness-Type Double Patenting

The obviousness-type double patenting rejections of Items 1(a)-1(e) each involve unpatentability over claims of Raghavan '267 either by itself of in view of other U.S. patents, as indicated above. A Terminal Disclaimer under 37 C.F.R. §1.321(c) filed herewith establishes that Raghavan '267 and the current application are commonly owned and, it is believed, overcomes the rejections under Items 1(a)-1(e).

Item 3: Claims 1-2, 4-5, 8, 12 and 27 under Section 102(b) Over Slagley et al.

With respect to the rejection of the above-referenced claims under Section 102(b) over Slagley et al., independent claim 1 has been amended to clarify that:

> at least one actuator operatively cooperat[es] with said intermediate finger follower to position said intermediate finger follower in two directions *independent of one another* relative to said cam to move said roller finger follower to position said engine valve at a desired, *decoupled* lift and phasing[;]
> (emphasis added)

and independent claim 27 has similarly been amended to clarify the steps of:

> actuating at least one actuator operatively cooperating with the intermediate finger follower in vertical and horizontal directions *independent of one another*, positioning the intermediate finger follower relative to the cam, and positioning the engine valve at a desired, *decoupled* lift and phasing.
> (emphasis added)

With respect to the elements of claims 1 and 27, the Examiner finds that Slagley et al. disclose:

> a valve actuator assembly (See Figs. 1-6) for an engine of a vehicle and the method of operating it comprising: a movable engine valve (12); a movable roller finger follower (34, 30) operatively engaged with said engine valve; a rotatable cam (14, 16); an intermediate finger follower (20; 56, 58) operatively engaged with said roller finger follower and said cam; and at least one actuator (60, 62) operatively cooperating with said intermediate finger follower to position said intermediate finger follower in horizontal and vertical directions relative to said cam to move said roller finger follower to position said engine valve at a desired lift and phasing[.]

Applicants agree with the Examiner insofar as Slagley et al.'s lifter guide 22 is able to control movement of the Examiner-named intermediate finger follower 20 in a first direction (horizontally). However, movement of the intermediate finger follower 20 in a second direction (vertically) is not independent of movement in the first direction: it is passive, and dependent upon the horizontal movement. In fact, Slagley et al.'s intermediate finger follower 20 has only one degree of freedom (horizontal, controlling phasing). Vertical movement (lift) is *coupled* to horizontal movement, and does not reflect a second degree of freedom. Thus, lifting and phasing are not "decoupled" as required by independent claims 1 and 27. Even if a rocker arm with a different shape were used, as suggested in column 3, lines 58-68 of Slagley et al., allowing valve lift to be increased or decreased, the valve lift would still be set and limited by the rocker arm shape; valve lift that is decoupled from phasing is not possible with Slagley et al., even with alternative actuation schemes, such as that of Figure 6.

Accordingly, because Slagley et al. do not teach an intermediate finger follower that may be positioned by at least one actuator "in two directions independent of one another ... to position said engine valve at a desired, decoupled lift and phasing," the Section 102(b) rejection of claims 1-2, 4-5, 8, 12 and 27 over Slagley et al. is believed to be overcome.

Item 4: Claims 1-2, 4-5, 12 and 27 under Section 102(b) over MacNeill.

The Examiner finds that:

> MacNeill discloses a valve actuator assembly (See Figs. 1-8) for an engine of a vehicle and the method of operating it comprising: a movable engine valve (4); a movable roller finger follower (16) operatively engaged with said engine valve; a rotatable cam (28); an intermediate finger follower (19, 21) operatively engaged with said roller finger follower and said cam; and at least one actuator (36, 42, 43) operatively cooperating with said intermediate finger follower to position said intermediate finger follower in horizontal and vertical directions relative to said cam to move said roller finger follower to position said engine valve at a desired lift and phasing[.]

Applicant submits that neither MacNeill's first embodiment (Figures 1-7) nor his second embodiment (Figure 8) offers an intermediate finger follower positionable with two degrees of freedom, i.e., "in two directions independent of one another" as required by independent claim 1, "in vertical and horizontal directions independent of one another" as required by independent claim 27, to position the "engine valve at a desired, decoupled lift and phasing."

With respect to the embodiment of Figures 1-7, MacNeill teaches moving his roller finger follower 16 in one direction to move the pivot 23 of the intermediate finger follower 19, 21 linearly with the roller finger follower 16. This does *not* comprise two degrees of freedom to achieve *decoupled* control of lift and phasing. Moving the pivot point 23 changes the angle between the links 18 and 19. As provided in MacNeill:

> the movement of the rocker arm 16 provides a variable mechanical multiplying function with is not available if the shaft 24 is moved. The variation in lever arm in conjunction with the change of angle between the links 18 and 19 provides a mechanism having a high degree of flexibility in that by varying the relative effects of these

two inter-related quantities many different lift characteristics may be obtained.
(col. 5, lines 72-75; col. 6, lines 1-5)

Moving rocker arm 16 changes the phase and, changes the angle between 18 and 19 which changes the lift. Phase and lift are *not* decoupled. MacNeill also considers varying the position of shaft 24 to vary the pivot point for link 19, and concurrently the angle between links 18 and 19. Again, this provides *coupled* variation in phase and lift, not decupled. With respect to the embodiment of Figure 8, the Examiner-named actuator 36, 42, 43 includes cam 42, 43 to replace the function of the return spring 26 of Figure 1 in high speed applications. Pivot point 38 is fixed; movement of the roller finger follower 16 effects the angle between links 19 and 36 in a coupled manner – phase and lift remain coupled.

Accordingly, because MacNeill does not teach an intermediate finger follower positionable with two degrees of freedom, i.e., "in two directions independent of one another" as required by independent claim 1, "in vertical and horizontal directions independent of one another" as required by independent claim 27, to position the "engine valve at a desired, decoupled lift and phasing," it cannot anticipate independent claims 1 and 27 nor claims which depend from claim 1 or claim 27. The rejection of claims 1-2, 4-5, 12 and 27 is thus believed to be overcome.

Items 6-10: Rejections of Various Claims Under Section 103(a) with Slagley et al. as the Primary Reference and in View of Various Other Cited Art.

Each of items 6-10 involve rejections over Slagley et al. in view of other art. However, as discussed with respect to the rejections under Section 102(b), Slagley et al. does not provide the "independent" movement in two directions to position the engine valve at a "desired, decoupled lift and phasing" as required by independent claims 1 and 27 and also by amended independent claim 14. The additional art cited by the Examiner also does not provide these limitations missing from Slagley et al., nor does the Examiner indicate that they do. A *prima facie* case of obviousness requires that the prior art references teach or suggest all claim limitations of the examined claim. (MPEP 2143.03). Accordingly, for the same reason that the

rejections under Section 102(b) relying on Slagley et al. as a primary reference are overcome, the rejections under Section 103 set forth in Items 6-10 are believed to be overcome.

Item 11: Rejection of Claim 3 under Section 103(a) over MacNeill in View of Vorih.

The Examiner relies upon MacNeill as the primary reference for finding claim 3 obvious over MacNeill in view of Vorih. As discussed above with respect to Item 4, MacNeill does not teach an intermediate finger follower positionable "in two directions independent of one another" to position the engine valve "at a desired, decoupled lift an phasing" as required by amended claim 1. Vorih also fails to provide these claim limitations. Again, a *prima facie* case of obviousness requires that the prior art references teach or suggest all claim limitations of the examined claim. (MPEP 2143.03). Claim 3 depends from claim 1. Accordingly, because all of the limitations of claim 1 are not taught or suggested in MacNeill and Vorih, the rejection of claim 3 under Section 103(a) is believed to be overcome.

Item 12: Rejection of Claim 13 under Section 103(a) over MacNeill in View of Vorih.

As discussed above with respect to Item 11, MacNeill and Vorih do not teach or suggest all of the limitations of claim 1. Because claim 13 depends from claim 1, it is allowable for at least the same reasons that claim 1 is allowable.

Item 13: Rejection of Claim 28 under 35 U.S.C. § 103(a) over Cecur in View of Kumm.

With respect to claim 28, the Examiner finds that:

> Cecur discloses a valve actuator assembly (See Fig. 1) for an engine of a vehicle comprising: a movable engine valve (19); a movable roller finger follower (37) operatively engaged with said valve; a rotatable cam (29, 33); an intermediate finger follower (59, 55, 61) operatively engaged with said cam through a first roller (55), and operatively engaged with said roller finger follower through a second roller (61), at least one actuator (67) operatively cooperating with said intermediate finger follower to position said intermediate finger follower in two directions relative to said

> cam to move said roller finger follower to position said engine valve at a desired lifting and phasing.
> Slagley (sic) further discloses a curved ramp (71) which guides movement of said second roller, however, fails to disclose the said ramp being a stationary curved ramp.
> The patent to Kumm on the other hand, teaches that it is conventional in a variable speed drive system art, to utilize a stationary curved ramp (76) to guide roller bearing follower (77).
> It would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the stationary curved ramp as taught by Kumm in the Slagley (sic) device, since the use thereof would provide an cost effective engine actuating mechanism, to impose an efficient variable valve movement.

The Examiner refers to a curved ramp (71) of the Slagley device. Applicant believes that the Examiner meant to refer to the curved ramp (71) of Cecur, as Slagley does not teach a component 71 and the rejection is based on Cecur in view of Kumm, not Slagley.

Applicant agrees that Cecur's curved ramp 71 is not stationary. It is *necessarily* movable to allow the variable lift function of the cam assembly 41. Cecur provides that:

> As may best be seen in Figure 6 . . . rotational input motion to the eccentric actuator 67 results in longitudinal motion of the eccentric link member 65, thus pivoting the cam assembly 41 about its pivot location (i.e., the cylindrical support member 49) . . . [A]s the eccentric actuator 67 rotates over a range of about 600 of rotation, the cam assembly 41 is pivoted between the extreme positions shown in FIGS. 4 and 5, corresponding, respectively, to a maximum lift condition ("MAX. LIFT" in FIG. 7B) and a minimum lift condition ("MIN. LIFT" in FIG. 7B). It may be seen in FIG. 7B, by comparing the various lift graphs, that lift duration is generally proportional to lift amplitude, and that both are directly proportional to angle of the cam assembly 41, as it is moved from

the minimum lift condition of FIG. 5 to the maximum lift condition of FIG. 4.
(col. 5, lines 8-32)

Thus, it is necessary to move cam assembly 41, including cam member 51 with cam surface (Examiner–named ramp 71) in order to vary lift.

The Combination of Cecur and Kumm makes Cecur Unsatisfactory for Its Intended Purpose

A *prima facie* case of obviousness requires that the prior art references teach or suggest all claim limitations of the examined claim. (MPEP 2143.03) Additionally, an obviousness rejection requires that the proposed modification cannot render the prior art unsatisfactory for its intended purpose; if it does, then there is no suggestion or motivation to make the proposed modification and the modification is not obvious. (MPEP 2143.01)

As discussed above, it is necessary to move Cecur's cam assembly 41, including cam member 51 with cam surface 71 (Examiner –named ramp 71) in order to vary lift of the valve 19. Yet, the Examiner finds that if would have been obvious "to have utilized the stationary curved ramp as taught by Kumm in the Slagley (sic) [Cecur] device." Applicant respectfully disagrees: Kumm's stationary curved ramp would not allow variation in lift of Cecur's valve 19. Thus, the proposed modification of Cecur to incorporate Kumm's stationary curved ramp 76 in place of Cecur's movable curved ramp 71 would render Cecur unsatisfactory for its intended purpose of varying valve lift. At least for this reason, the rejection of claim 28 under Section 103(a) as unpatentable over Cecur in view of Kumm is believed to be improper.

The Combination of Cecur and Kumm Changes the Principle of Operation of Cecur

Additionally, with respect to a rejection under Section 103(a), if the proposed modifications or combinations of the prior art would change the principle of operation of the prior art invention being modified, then the teachings are not sufficient to render the claims *prima facie* obvious. MPEP 2143.01; discussing *in re Ratti,* 270 F.2d 810, 813; 123 USPQ 349, 352 (CCPA 1959) where an obviousness rejection was reversed because the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate."

As discussed above, Cecur's curved ramp 71 must move to attain the desired variable valve lift. Utilizing the stationary curved ramp 76 of Kumm in Cecur would require that Cecur's entire cam assembly 41 be stationary. This would change the fundamental operation of Cecur, which teaches that cam assembly 41 pivots about point 49. In fact, the actuator 67 or Cecur's control arrangement 63 which moves point 45 would be rendered unnecessary and useless if the curved ramp 71 was to be stationary. Thus, it is believed that the combination of Cecur and Kumm changes the principle of operation of Cecur and thus the rejection of claim 28 on this basis is believed to be improper for this reason as well.

Claim 28 is amended to correct the spelling of "engaged".

No Basis Provided for Rejection of Claims 6 and 7.

The Office Action Summary indicates that claims 6 and 7 are rejected. However, no specific basis is provided in the Detailed Action for the rejection of these claims. In any event, claims 6 and 7 depend from claim 1 and are allowable over any of the prior art cited by the Examiner with respect to claim 1 for at least the same reasons that claim 1 is allowable.

Conclusion

With the concurrently filed Terminal Disclaimer, the amendments to claims 1, 14, 27 and 28 and the analysis set forth above, all of claims 1-28 are believed to be in condition for allowance, which action is hereby respectfully requested.

Respectfully submitted,

MADHUSUDAN RAGHAVAN

By Kathryn A. Marra

Kathryn A. Marra
Reg. No. 39,106

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GENERAL MOTORS CORPORATION
Legal Staff Mail Code 482-C23-B21
P.O. Box 300
Detroit, Michigan 48265-3000